

Successful Methods

Construction · Road Making · Engineering · Industrial · Mining



Vol. 5.

July 1923

No. 7

They Lessen the Cost of Production



RANGE TYPE OF AIR DUMP CAR—IT'S A WESTERN

THIS is the Range Type of air dump car which is being installed on the Mesaba Iron Range in large numbers—a Western 30-yard automatic air dump car of the Compression Lock Type.

An order for one hundred such cars from a single concern—a repeat order—is now being filled for stripping iron ore in a district given over to the greatest steam shovel operation the world has seen.

Western
That's Why

Why do the engineers of a concern which has reduced earth moving to a science, recommend Western cars instead of other makes? Because they increase production and lower costs. They will move more dirt and cost less for repairs than other cars. They will **OUTWORK** and **OUTLAST** any other dump car on the market.

Dump car catalogue S-51 pictures and describes Western cars in detail. Send for it if you have not already received it.

Western Wheeled Scraper Co.

Earth and Stone Handling Equipment
AURORA, ILL.

Successful Methods

A Magazine of Construction Service

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Vol. 5

JULY, 1923

No. 7

Our Birthday

WITH this issue SUCCESSFUL METHODS begins its fifth year. Contrary to the usual custom of publications, we have no boasts to make about our past. Nor do we make any promises for the future.

We have never tried to make money out of running this publication. We are satisfied just about to break even. Nor do we aspire to be much bigger. Quantity and quality rarely go together.

Our chief ambition is that those who receive SUCCESSFUL METHODS may get an idea worth while out of it now and then. Anyway, we thoroughly enjoy the job of running SUCCESSFUL METHODS, which we hope may have many more birthdays.

Two-Strip Concrete Road Work

FOR various reasons concrete roads are being built all over the country in two strips. Without going into the reasons for this method of construction, it appears that more and more two-strip work will be done. Methods of handling concrete road work in this manner have, however, by no means been standardized. In fact, there is a wide difference of opinion as to what is good practice in several details.

For example, the mechanical subgrader has been used successfully on two-strip work in several States. But in a few States, contractors still think that it is impracticable to use a subgrader on 9-ft. and 10-ft. slabs. They consider that the subgrader will interfere with the roller and with motor trucks. Wider knowledge of the ease with which the subgrader is quickly shifted out of the way will soon overcome the objections of the few who doubt the practicability of mechanical subgrading of narrow slabs.

Some contractors also are worried about how to use a roller successfully in preparing the subgrade for the narrow slabs of two-strip work. The remarkable reception given the light three-wheel motor rollers introduced this year dispels all need for worry on this score. These little rollers just fill the bill on narrow slab work, although they were designed primarily for wider construction.

When it comes to finishing two-strip work there has been some theoretical discussion about the use of mechanical finishing machines on the second strip. One State apparently has seen fit to bar machine finishers on the second strip. This will not last long because mechanical finishers have been and are now being used with complete success on the second strip

in various parts of the country. One job also was done in this way in France last year without any trouble.

There are various other details of handling two-strip work on which a difference of opinion will continue for a while. Meantime competition will bring to the front the most economical methods of doing the job well.

Year Around Work

EVERY once in a while some engineer or contractor discovers for himself that it is more economical to continue a job right through the winter than to shut down for cold weather. Even some of the trade papers get excited over the subject now and then.

That reminds us of what Dennis Madden, a construction superintendent for more than forty years, told us a while ago. We met him on the street in Chicago just before starting on our honeymoon. In response to our enthusiasm he replied

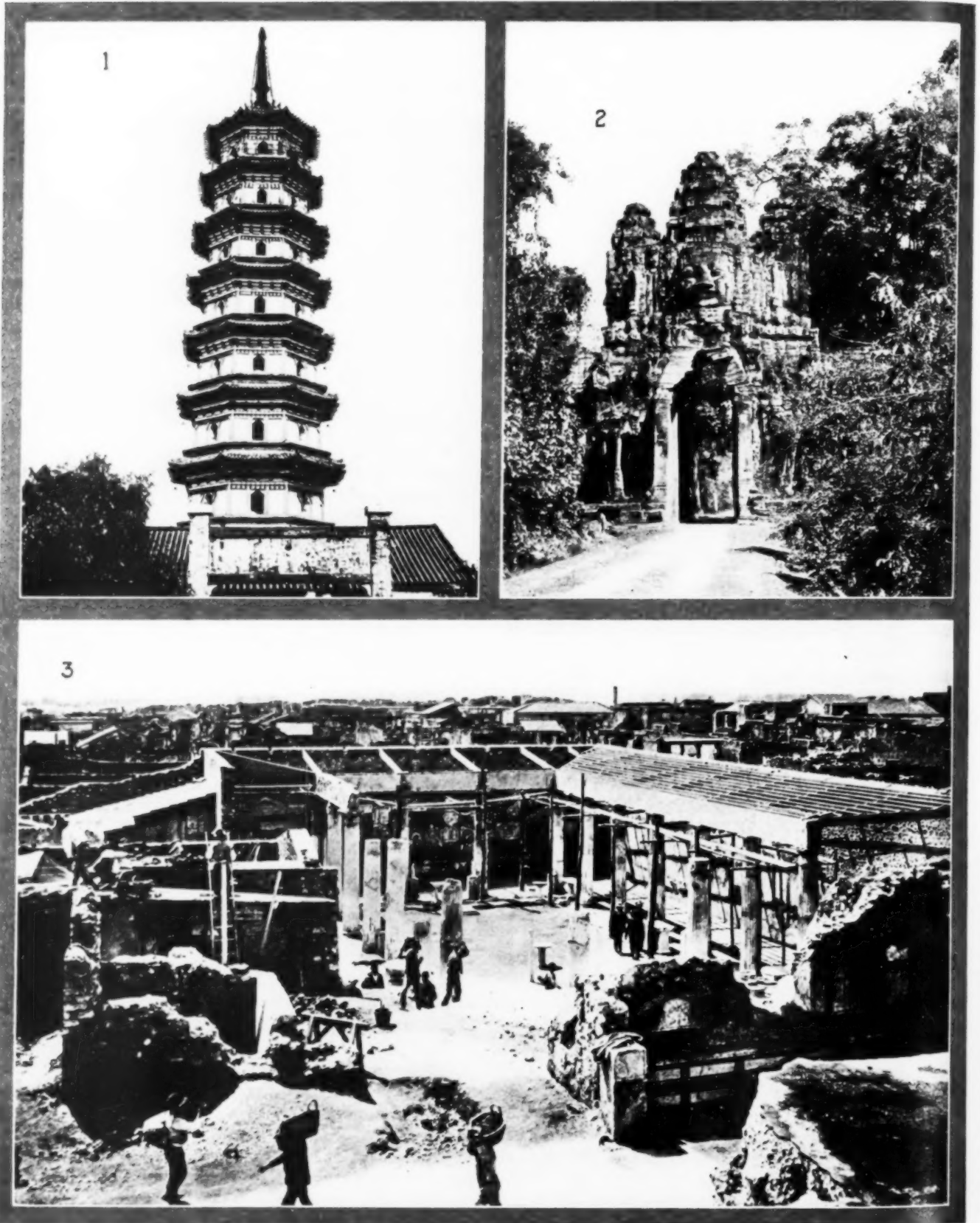
"Well, now, me boy, does ye think ye have discovered matrimony?"

Construction work has been carried right through the winter more and more every year since about 1905. The time long ago passed when it was considered necessary to shut down all jobs with the first frost. This coming winter we shall likely see more outdoor work than ever, because lack of labor and materials is delaying much work on which a shutdown for winter cannot be permitted.

Concreting at low temperatures is comparatively easy on mass work and on buildings that may be inclosed with canvas. Gravity chuting of concrete in a large building continued right through last winter in Duluth at temperatures well below zero. Many other similar examples could be cited. Even some concrete road work has been done with the temperature below freezing.

The big chance for increasing the spread of construction work through the year appears to be in the production and handling of materials. Quite a bit has been done in this direction in the Middle West. Methods of paying for materials delivered in advance of actual construction have been modified in some sections of the country to encourage this practise. In no other single direction is there so large a chance to overcome the shortage of men and materials. Now is the time to get ready to make the most of the opportunity.

Fashions in Buildings



- 1—The skyscraper idea seems to have had its vogue in China many years ago. This pagoda in Canton is 270 ft. in height and was built in the 6th Century. © P & A Photos
- 2—A relic of an ancient and forgotten city in the northwest corner of Cambodia, Indo-China. The age of this structure is unknown. © International
- 3—A well remembered city of ancient times. The structure shown in the photograph is in Pompeii, where excavations are still going on which reveal the beauty of the city which was so suddenly destroyed. © Keystone

Ancient and Modern

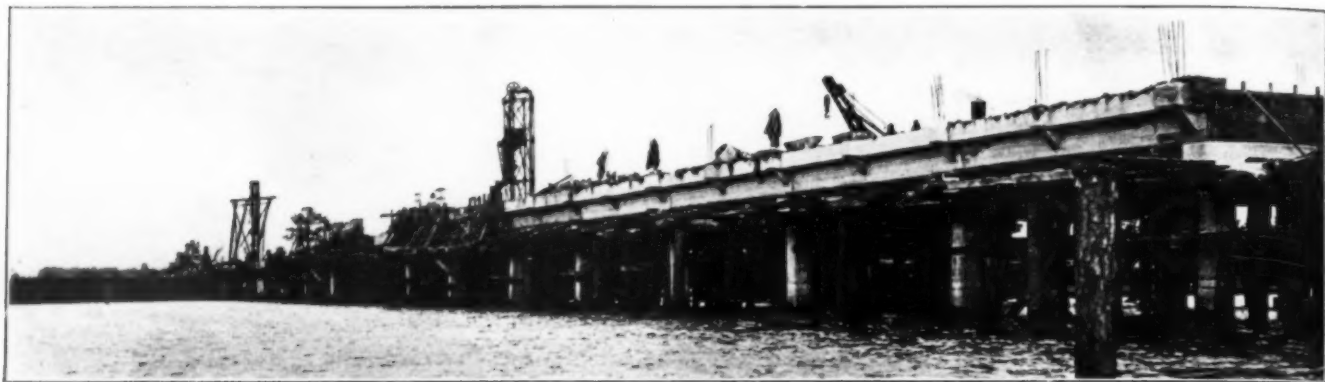


- 4—Putting up a small building of the 1923 vintage in Hutchinson, Kan. Burt & Tripp are the contractors.
 5—A fine example of the modern skyscraper. The Sheldon, a bachelor apartment on Lexington Avenue, New York City, said to be the highest apartment house in the world. © E. Galloway
 6—A modern American home at Beverly Hills, Cal., which will house the famous and incomparable Charlie Chaplin. The builder wisely put up a plainly visible sign on the front lawn. © P & A Photos

BRIDGING THE SAVANNAH

Structure More Than Four Miles Long Consists of Five Concrete Trestles with Steel Draw Span Over Main Channel

By OLAF OTTO



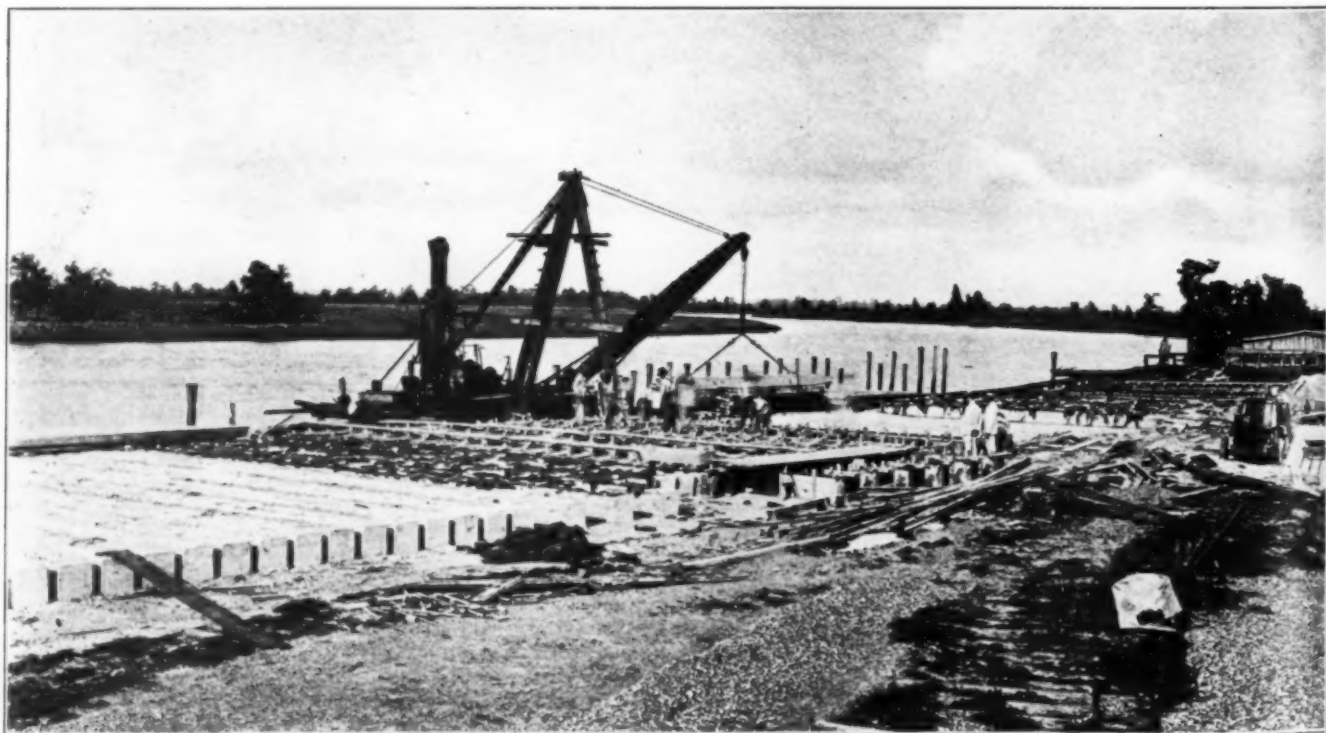
A BRIDGE which will open up traffic between Savannah, Ga., and the southern portion of South Carolina as well as furnish a through route close to the coast, is now being built to cross the Savannah River about 8 miles north of the city of Savannah.

Because of the low land on each side of the river, it proved necessary to plan a bridge 4.6 miles in length, consisting of five concrete approach trestles having a total length of 5670 ft. These trestles which alternate with earth embankments cross the Main Savannah, the Middle Savannah and the Back or Little Savannah rivers. A steel span will be built over the main channel as the Savannah River is navigable at

this point. This span will be 240 ft. long. The bridge is to have an 18-ft. roadway and its finished grade will be 9 ft. above high water.

The photographs which accompany this article show numerous details of the building of this bridge. The plans provide for two types of concrete structures, one type having 25-ft. reinforced concrete beam spans on reinforced concrete pile bents, and the other or pedestal type having 35-ft. reinforced concrete beam spans built on bents cast in place and set upon reinforced concrete piling.

All of the reinforced concrete piles are cast at a yard about one-half mile from the bridge and are made



CASTING PLATFORM AT YARD HALF A MILE FROM SITE OF BRIDGE. THE CONCRETE PILING IS CAST HERE

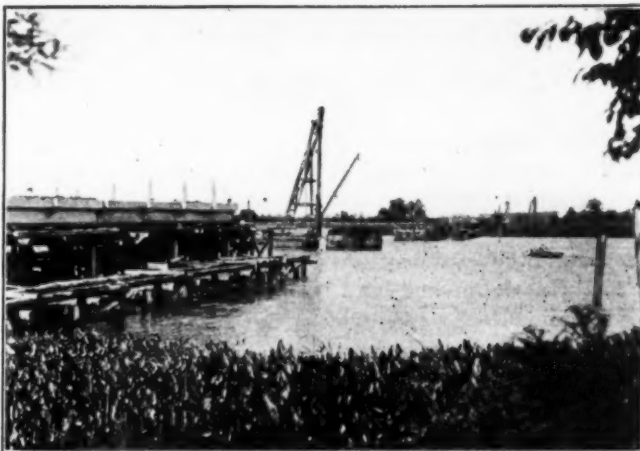
in sizes 14, 16 and 19 in. square and from 25 to 50 ft. in length, the various lengths required being determined by driving test piling. The greater number of the piles being used at the present time are 35 ft. in length. These piles are cast upon a large platform and the two sides are stripped 24 hours after being poured. Then they are covered with straw and sprinkled with water for at least 30 days before they are placed on wooden scows and taken to the bridge



THIS PHOTOGRAPH SHOWS THE SUBSTANTIAL TYPE OF CONSTRUCTION

to be driven in the proper location with a steam pile hammer assisted by two powerful water jets.

On the 25-ft. span 4 precast piles to the bent are driven vertically except in the end or abutment bents, where 6 precast piles are used. On the pedestal type spans 8 precast piles are driven in a longitudinal batter.

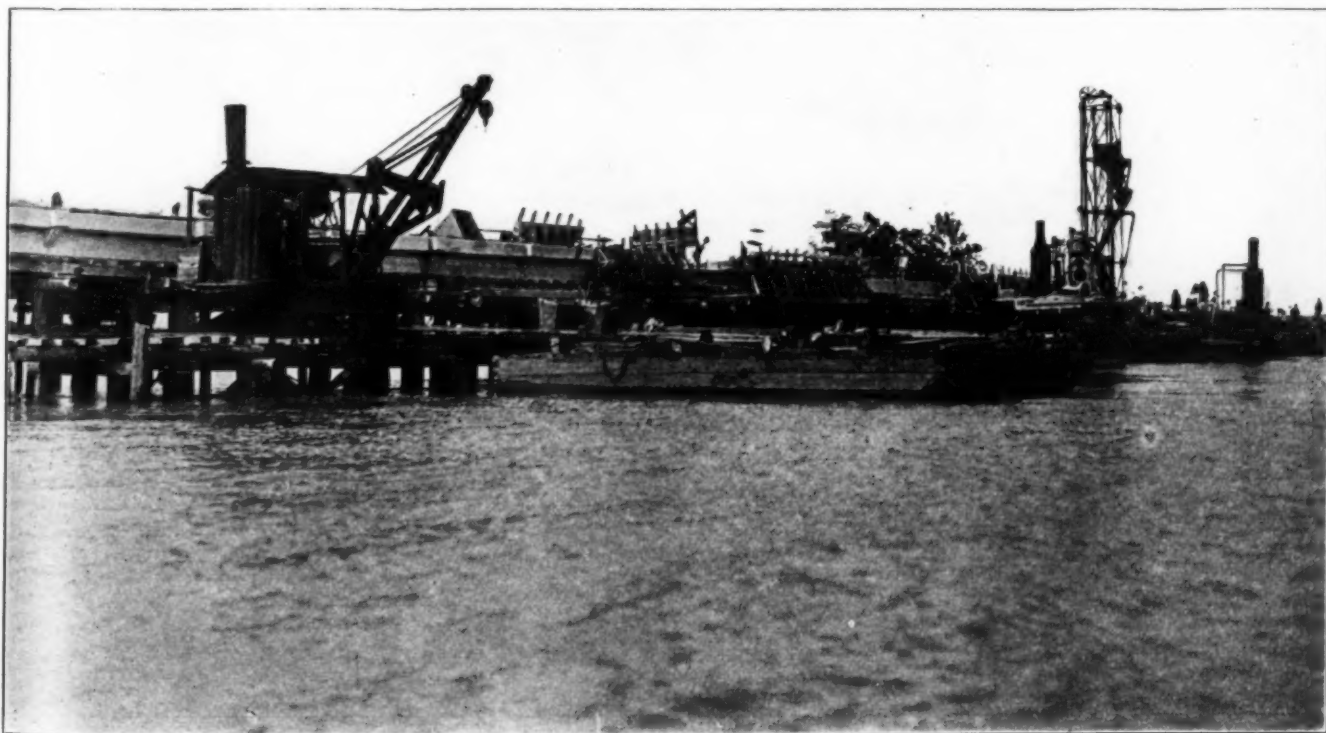


PREPARING THE WAY FOR THE STEEL CENTER SPAN

The total cost of the project will be in the neighborhood of \$600,000 and will be paid by Chatham County, Ga., by an allotment of Federal Aid funds and in other ways.

The Georgia State Highway Department represented by B. P. McWhorter, made the survey for the bridge which was designed by Searcy B. Slack, Bridge Engineer of the Department. The first work done was by A. J. Twiggs & Son of Augusta, Ga., who handled contract No. 1, which required the placing of 244,000 cu. yd. of earth embankment fill. Contract No. 2 was awarded to the writer. This included the construction of 5 reinforced concrete bridges and 3 reinforced concrete channel piers, which are to support the steel swing span.

Work was begun late in 1922 and it is expected that the bridge will be finished and ready for use by the public about June, 1924.



AT WORK ON ONE OF THE CONCRETE BRIDGES

SAN FRANCISCO BUILDS BIG SWIMMING POOL

It Will Be 1000 Feet in Length and Will Provide Room for Host of Bathers

NOT content with the Pacific Ocean for bathing purposes, the Park Commission of San Francisco is building an enormous swimming pool, said to be the largest in the world. It is located along the Ocean Beach at the intersection of Sloat Boulevard and the Great Highway, and will be 1000 ft. in length and 100 ft. in width, except at the center, where it will be 150 ft. wide. The pool will be from 3 to 10 ft. deep and will have a 14-ft. diving pit. The total cost will be about \$80,000.

The excavation is being made entirely in sand. The photograph at the bottom of the page shows a general view of the pool and the method used in the excavation. A steam shovel is served by two dinky trains which haul the sand to one of the fills of the Skyline Boulevard, which starts close to the new pool and may be seen at the right in the photograph at the bottom of the page. The excavation is kept clear of water by an electric pump.

The smaller photograph at the top of the page shows the shovel at work and at the left shows a plank roadway built on the sand for the use of the motor trucks. It was necessary to build this as the sand was too deep and heavy for the trucks. The disposal of the excavated material by using it for the new boulevard has materially decreased the total expense of the project.

This is only one of the many improvements which the San Francisco Park Commission is making. The development of that part of San Francisco which fronts on the Pacific Ocean is being taken care of in such a way that the public will not lose one of

the city's greatest assets, something which has often happened in other American cities. The Skyline Boulevard will provide a new and exceedingly picturesque link in San Francisco's already excellent boulevard system, and the big swimming pool will bring pleasure to thousands.

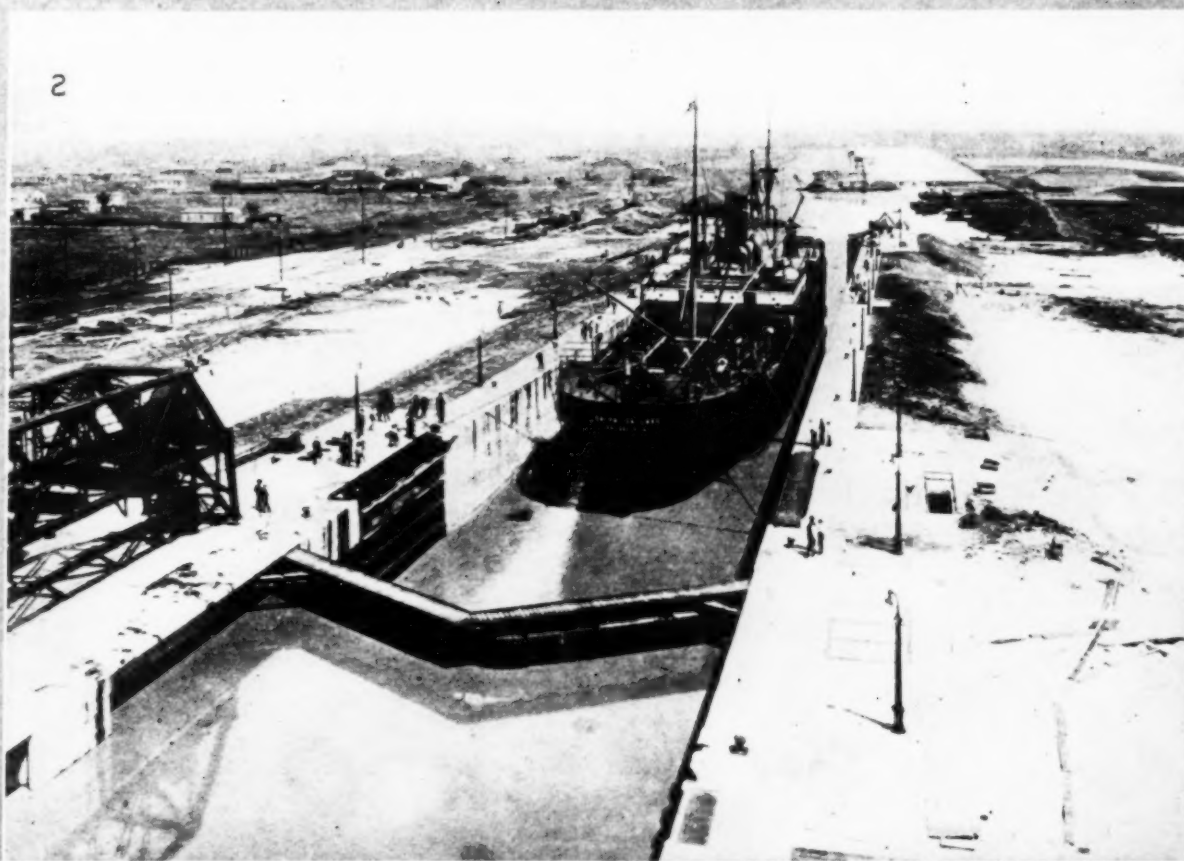


EXCAVATING THE BED OF THE POOL WITH
A STEAM SHOVEL



A GENERAL VIEW OF THE EXCAVATION. THE SAND REMOVED IS USED FOR THE CONSTRUCTION OF THE SKYLINE BOULEVARD WHICH MAY BE SEEN IN THE RIGHT BACKGROUND

Water Gates of Two Cities



1—These locks connect Union and Washington Lakes with Puget Sound and provide access to the harbor of Seattle.
2—The first ocean going ship to pass through the industrial canal into the inner harbor of New Orleans.

SURFACE TREATMENT OF GRAVEL ROADS

Details of Process Used in State Which Is a Leader in Maintenance Methods

By J. T. DONAGHEY,

Maintenance Engineer, Wisconsin Highway Commission.

WISCONSIN has approximately 78,000 miles of all types of public highways, of which 25,000 miles are surfaced with gravel. Thirty-five hundred miles of the present 7500-mile State trunk highway system has a gravel surface. There are probably 1000 miles of our gravel surfacing that carries an average daily traffic in excess of 300 vehicles.

Where such conditions prevail it becomes necessary to protect the gravel surface by some form of surface treatment. We have tried out various methods and materials and believe we get the best and most lasting results with light tar surface treatments. We find that a gravel containing quite a percentage of silt or foreign matter may be treated successfully with light tar, provided it is handled in the proper manner. In some instances, however, with a traffic of 300 vehicles per day or more, it may be cheaper to maintain a road surface by adding the proper amount of new material annually, which we estimate to be about 400 cu. yd. on a 20-ft. surface. We must necessarily consider the value of the material lost annually and the danger and nuisance existing due to the prevalence of dust.

For the past few years our specifications have provided for using no material in the top 5 in. of a gravel road surface except when crushed to a size that will pass through a 1-in. round opening. All material passing over a 1-in. ring is recrushed by a secondary crusher and returned to the bin. The material is not separated but is all deposited in the same bin and loaded in the trucks from a chute in the bottom of the bin. This insures a uniform gradation of the material.

On all resurfacing of old gravel roads the same specifications prevail. This costs us somewhat more

than pit run gravel or gravel crushed to a larger size would, but we believe it is worth much more than the difference in the cost, especially where the surface must be scarified frequently.

The surface is thoroughly scarified to a width of 20 ft. and to a depth of the deep holes appearing in the surface, which is about 2 in. It is necessary to lap the scarifier about one-half in order to get the surface completely scarified, as material of this kind becomes extremely solid under traffic and once over with the best of scarifiers will not produce the results desired.

Immediately following the scarifier the surface is shaped up with a 12-ft. blade grader to a uniform cross section. The material is generally loose and dusty on account of the fine content, and time is permitted to elapse until the surface becomes well compacted. A good heavy rain will aid materially. Following a rain the surface is again shaped up and traffic compacts it quite rapidly—enough so that it is possible to sweep the surface with a sweeper almost immediately after shaping. The sweeper is hauled by a motor truck and leaves quite a windrow of dust and loose gravel—so much so that a light grader is used to push the windrow of dust and loose gravel out of the way of the sweeper on its second trip. The surface is swept twice in this manner, and after the second sweeping the coarser gravel in the surface projects just a little above the rest of the surface, producing practically a mosaic surface.

Some gravel surfaces may not need scarifying and may be shaped up very satisfactorily with a heavy blade grader, especially so if done immediately after



SWEEPING OFF THE SURFACE WITH BROOM

rain or following the spring breakup. Any method that will produce a well-compacted uniform surface will be satisfactory.

After the surface is swept clean the tar is applied as follows: Light tar may be applied cold, but better results will be obtained if slightly heated. The distributor should be thoroughly cleaned before beginning operations and kept clean. There should be a double strainer on the tank intake in order to exclude all cinders that may be in the tank car, as it is almost impossible to receive a tank car of tar without having some cinders to contend with. It is also necessary to have several extra nozzles, so that if one becomes clogged it can be replaced immediately, which will permit the distributor to operate evenly. Even distribution is essential.

The priming coat is applied at the rate of 1/6 gal. per square yard on new surface treatments, and no sand or covering is spread over it. Twenty-four hours or more are permitted to elapse after the priming coat has been applied, during which time traffic irons it out and gets the surface in a fairly uniform condition. If conditions will permit, immediately following the application of the priming coat the sand for covering the second coat should be deposited along the shoulder of the road. Be sure that the windrow of loose dust and gravel left by the sweeper has been pushed clear out over the shoulder with a grader before the sand is deposited along the shoulder, as the sand piles should be on the shoulder outside of the edge of the surface treated portion and not permitted to mix with the loose material swept off the surface.

Clean, sharp torpedo sand, or fine stone chips is the best material to use for covering, and for a 20-ft. surface it will require about 50 cu. yd. per mile to

vents the tar from running and permits it to penetrate the surface, thereby forming a skincoat and not a mat. The covering, if deposited along the shoulder, is also available to add immediately in any amount desired to prevent picking up and cure bleeding.

Should several days elapse before the second coat is applied and the surface has become slightly loosened or dirty, it should again be swept lightly to remove any loose material. The distributor is now set to spread about 1/3 gal. per square yard on a first surface treatment, and care must be taken to have the tar spread uniformly.

Before starting the distributor at this time, ten men are stationed along the sand piles from 50 to 100 ft. apart. When the distributor is started along



SCARIFYING GRAVEL SURFACE BEFORE TREATMENT

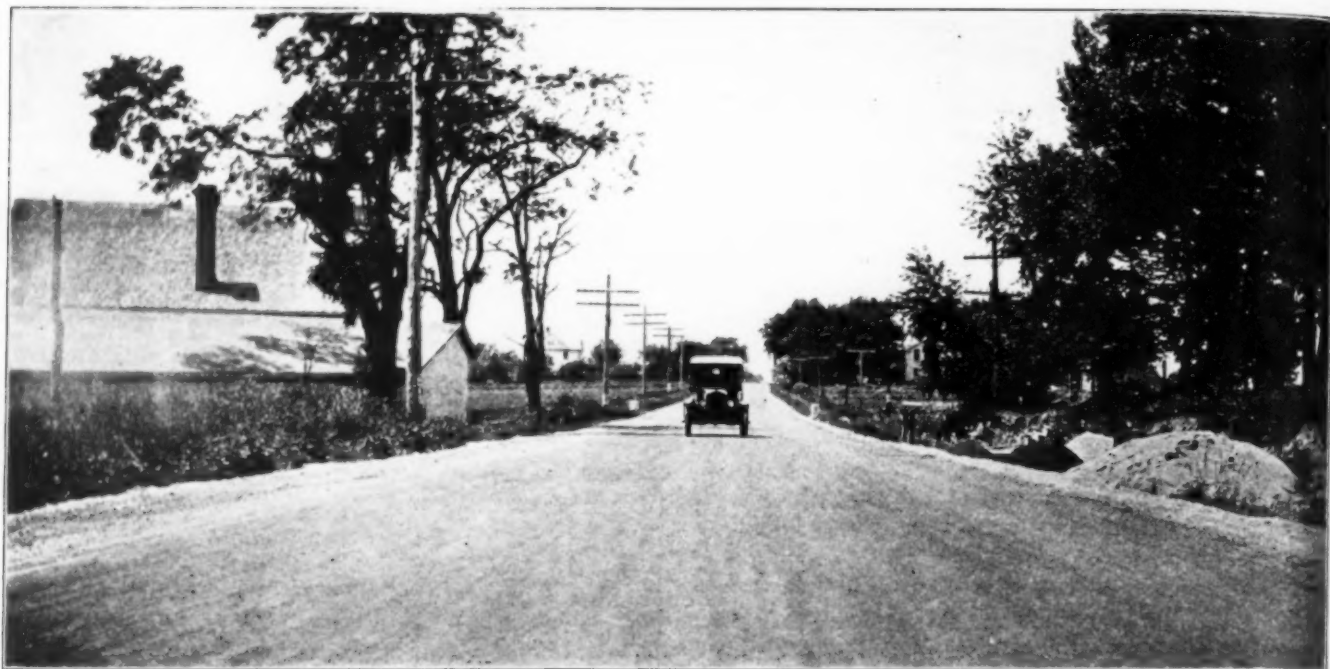


SHAPING SURFACE AFTER SCARIFIER

cover the surface properly. The sand should be deposited in piles of about 1/4 cu. yd. each and 25 ft. apart, and care should be taken that the inside of the pile of sand be entirely clear of the outer edge of the surface treated portion, for if a thin film of sand opposite the piles should be covered with the second application of tar it would pit out at that point and be very unsatisfactory.

The reason for depositing the sand in advance of the application of the second coat is that a certain amount of sand must be applied *immediately* after the second coat of tar touches the surface, which pre-

the road, the man at the first sand pile spreads a little less than one-fourth of the sand in his first pile on the width covered by the distributor opposite the sand pile, doing the same with the next pile, and so on, working rapidly. The second man does likewise when the distributor reaches a point opposite his first sand pile, and so on down the line of men. The first man, when he reaches the point where the second man started spreading, moves ahead of the line of men, beginning a new station the required distance from the tenth man in line. Handling the covering in this manner permits applying a small amount immediately after the tar touches the surface of the gravel and, as stated before, prevents the tar from running off the road surface and permits it to penetrate the gravel, which is what we want. To do this part of the work cheaply and rapidly on a large mileage, there should be two distributors on each job, one being loaded while the other is distributing. There will naturally be a certain amount of time elapse between the loads, which permits the sand spreaders to go back and add more sand where needed to keep the tar from running off the surface or to stop picking up if traffic is causing the surface to pick up. Where but one distributor is used it may be possible to work with less than ten spreaders, especially if they are willing to work exceptionally fast while the distributor is working and take it a little easier while they are getting another load. However, there is generally enough work and more for the ten spreaders. The



ROAD ELEVEN DAYS AFTER APPLICATION OF SURFACING

distance the job is from the supply of tar will, of course, enter into the question also.

The other side of the road is handled in just the same manner, and the distributor should be so equipped that two trips over the 20-ft. road will cover adequately the whole of the surface. If it is thought best to surface treat wider than 20 ft., the distributor width must be extended correspondingly.

Extreme care must be taken to avoid spreading too much covering on the second coat until it has had time to penetrate the surface. If too heavy a covering is spread, or if the spreaders do not use care, and dump full shovels in a place, the result will be that the excessive amount of covering will absorb or blot the tar and prevent it from penetrating the surface and will result in a mat rather than a skin coat. The spreaders should use square point shovels and learn to throw the sand from the shovel in a manner

that will produce an even and smooth application.

If the weather is reasonably warm, penetration will immediately take place, and after two hours have elapsed there is little danger in applying more sand than is necessary, as the tar will then have penetrated sufficiently so that the excessive covering will not blot the tar and form a mat rather than a skin coat. One or two extra men should be kept on each pile for at least a day or two following the second application to apply sand where the surface starts to pick up or bleed, and a small amount of covering should be left in about every third pile for this purpose.

Another article by Mr. Donaghey, which will be printed in the August issue of SUCCESSFUL METHODS, will describe in detail the methods used in Wisconsin in patching the macadam roads and keeping in shape the surfacing, the application of which has just been so thoroughly discussed.

MINNESOTA TRAFFIC COUNT SHOWS BIG INCREASE

SOME figures recently issued by the Minnesota Highway Department show that the problem of road maintenance is daily becoming greater simply because of the steady increase in traffic. Actual traffic counts made in various parts of the State show that the daily average on the entire State highway system may exceed 1000 vehicles a day this year as against 710 last year and 565 in 1921. Despite Minnesota's activity in road building and road maintenance, it has proved impossible to keep improving the highways in like proportion. Commissioner Charles M. Babcock has this to say in regard to the situation which is paralleled in most, if not all, of the other States.

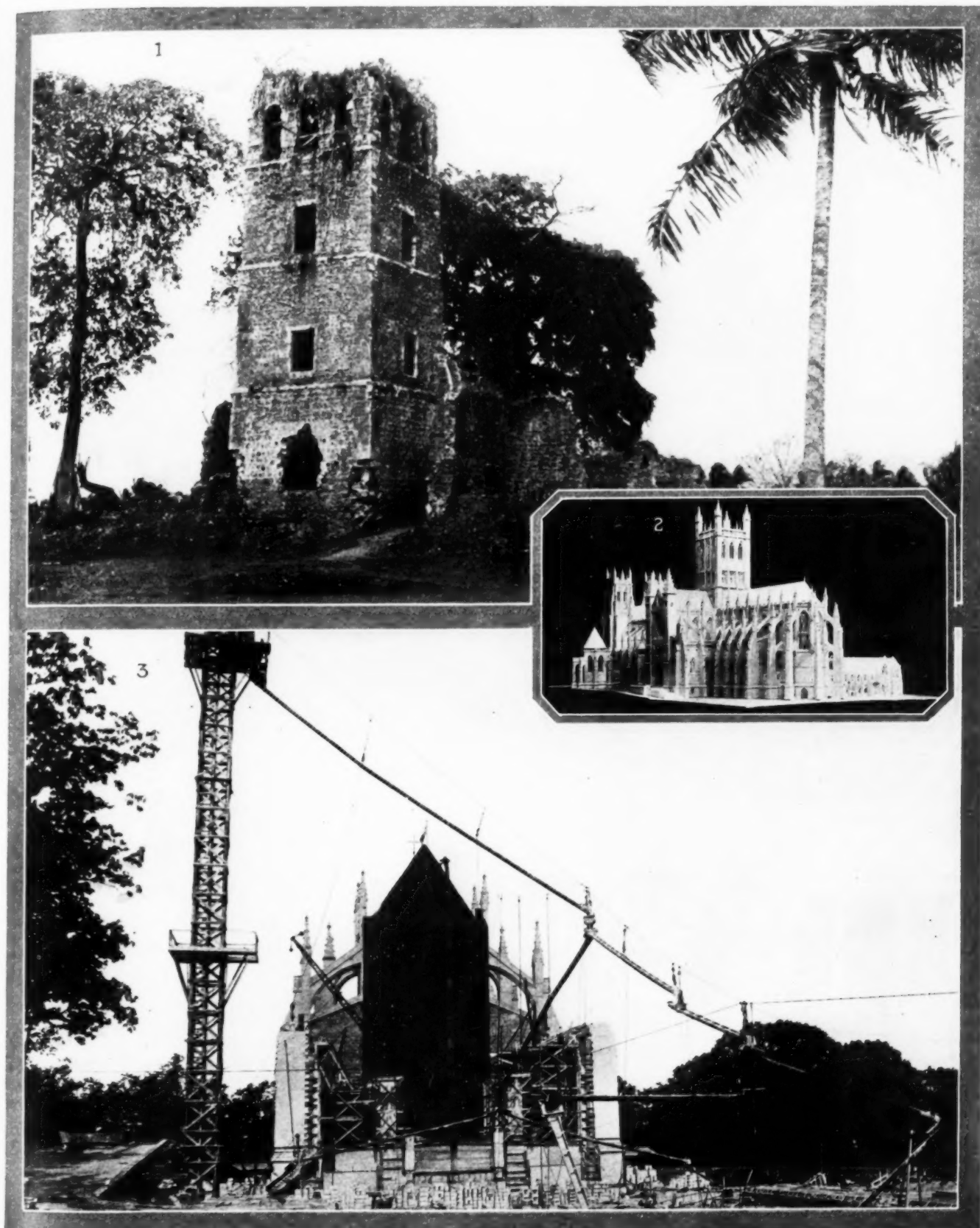
"Trunk routes in general are excellent now and probably will so continue except on the gravel-surfaced sections already subjected to overloading. The latter are the stretches which should be hard-surfaced

and those to which traffic is diverted from unimproved paralleling routes. Unfortunately they are the sections serving the largest numbers of Minnesota people and tourists as well and the State's reputation for good roads may suffer as a result.

"Until these more important roads are adequately improved, the plan will not justify expenditures on sections used by smaller numbers. Maintenance funds are ample, but no amount of money or care will keep up a gravel road after traffic passes a certain point. It is a matter of construction on these more important arteries."

Minnesota is now engaged in a better roads campaign and the various counties are being urged to issue bonds for highway construction and maintenance. The State Highway Commission is cooperating with the counties in every possible way.

Two American Cathedrals



1—This old church was one of the finest religious edifices on the American continent. It is the old cathedral in the town of Panama. Both town and cathedral have been abandoned. © Keystone
2 and 3—The latest expression of the cathedral builder's art in America. Work is now in progress on the great Episcopal cathedral which is being built in Washington. The small insert shows the cathedral as it will look when finished. © P & A Photos

BUILDING RIVER RETAINING WALLS IN DAYTON

Stationary Concreting Plant, Movable Forms, and Stiff Leg Derricks Used to Advantage in Miami Conservancy Work

By IVAN E. HOUK,
City Engineer, Dayton, Ohio.

IN connection with the local channel improvements now being completed in the Miami Valley, southwestern Ohio, as a part of the \$30,000,000 flood prevention works, the Miami Conservancy District found it advisable to build a number of concrete retaining walls along the edges of the channels. Although the primary purpose of constructing these walls was to obtain sufficiently large cross sections at places where the high and wide levees otherwise necessary would have required the condemnation of valuable real estate, the walls also serve to guide the river flow toward the ends of the bridges, thus tending to equalize the flow through the different spans.

As a general rule the walls are of two types, gravity and semi-reinforced; the former, which is entirely without reinforcing steel being used where the effective height is less than 10 ft., and the latter, which is partially reinforced, being used where the heights are greater. Wherever poor foundations, such as fine sand or muck, were encountered, timber piles were driven to solid strata to serve as foundations for the wall footings, the piles being spaced about 4 ft. apart each way and $\frac{3}{4}$ in. reinforcing rods being laid horizontally along the tops of the piles. Steel sheet piling was driven along the excavation wherever there was any danger of caving earth affecting the life of the trees above.

The excavations were made by movable stiff-leg derricks, operated either by steam or electricity, equipped with timber masts, steel booms, triple drum hoisting engines, and either clam shell or dragline buckets. These derricks also were used in operating the pile driver, in moving forms, hoisting the concrete buckets, and backfilling. The masts were generally from 22 to 39 ft. long and the booms from 56 to 62 ft. long. Since there was but little room available along the river front the concreting plant was made stationary and the concrete dumped from the mixer into side dump cars, or into bottom dump buckets loaded on flat cars, and hauled to the forms over narrow gage track by gasoline locomotives. When the footings were being poured the side dump cars were used and the concrete chuted directly into the forms. When the wall proper was under construction, bottom dump buckets were used, the buckets being hoisted by the derrick and dumped into the tops of the forms.

The walls were poured in 16-ft. sections, the intervening joints being keyed and thoroughly coated with asphalt. The footing was poured first, then the shaft from the top of the footing to the bottom of the coping, and finally the coping. Three complete sets of forms were generally kept on hand, so that as many as four or five sections could be poured in a week. Forms for the shaft consisted of 16-ft. panels of the



CONCRETING PLANT AT WORK ON ONE OF THE WALLS



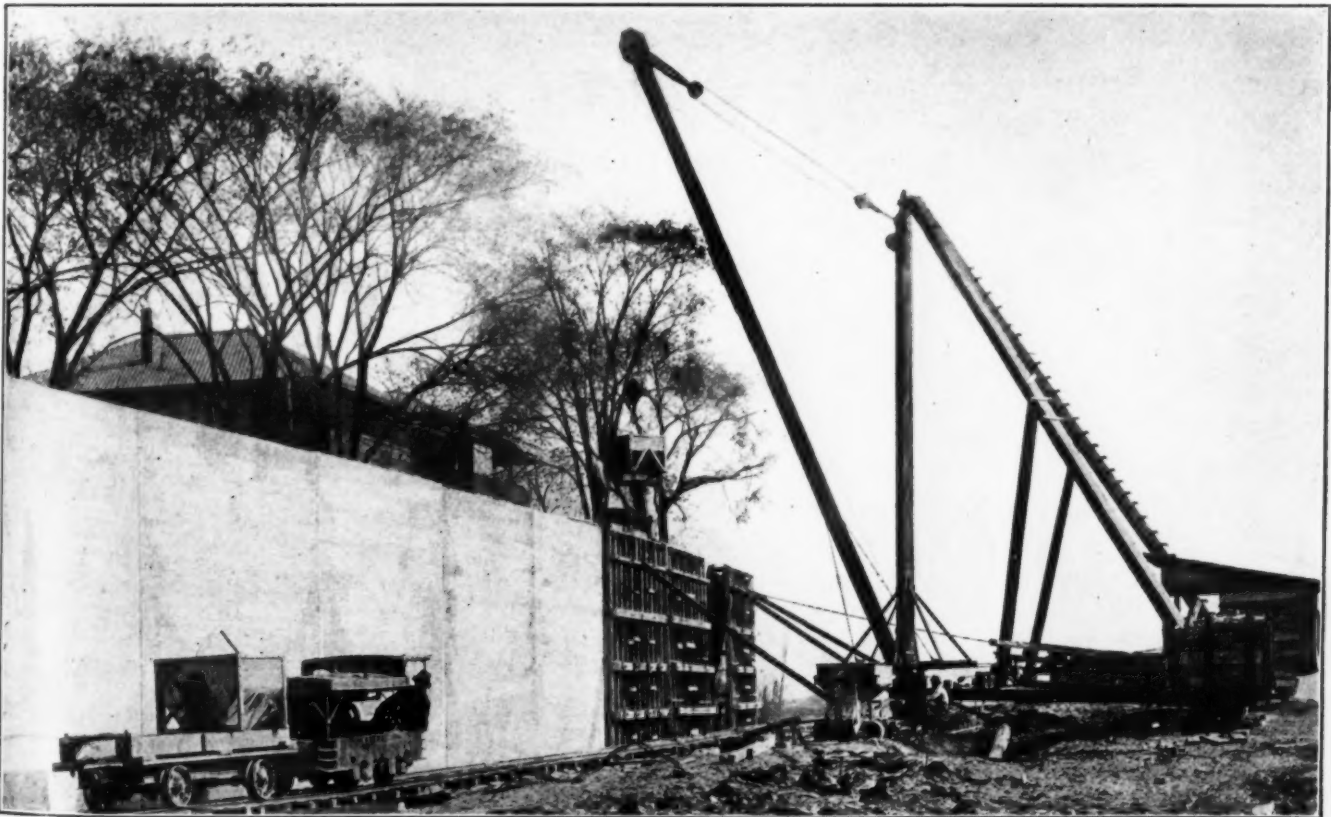
STIFF-LEG DERRICKS DID BIG SHARE OF THE WORK

proper height, there being one panel for the front and one for the back. These panels were made of 2-in. lagging, with 4-in. by 6-in. studs and 6-in. by 8-in. wales. Each section weighed 2 tons, but since they were moved with the derrick there were no delays on account of the weight.

The sand and gravel for the concrete was obtained from a screening and washing plant located on one of the spoil banks, where the material from the river excavation kept up an adequate supply of the proper

aggregates. The materials were separated into three grades, sand, running from $\frac{1}{4}$ in. down; fine gravel, running from $\frac{1}{4}$ to $1\frac{1}{2}$ in., and coarse gravel, running from $1\frac{1}{2}$ to 3 in.

The work was done by the forces of the District under the direct supervision of C. A. Bock, division engineer; E. L. Chandler, assistant division engineer, and H. A. Hanson, superintendent. Chas. H. Paul is chief engineer of the District, and C. H. Locher, construction manager.



CONCRETE WAS TAKEN FROM THE MIXER TO FORMS IN BOTTOM DUMP BUCKETS ON FLAT CARS AND DERRICKS THEN HANDLED THE BUCKETS

SUSPENDED TRACK CUTS COST OF DISPOSAL OF OVER-BURDEN AT CLAYWORKING PLANT

Standard Gage Car Takes Waste to Ravine and Dumps It from High in Air

A RATHER unusual but effective method of stripping clay deposits and disposing of the overburden has been adopted by the Adel Clay Products Company of Adel, Iowa. It was necessary to remove about 14 ft. of earth in order to get at the clay and some wholesale method of handling it had to be devised. For a while it was taken away by teams, but this proved slow and unsatisfactory.

Close to the clay beds was a deep ravine, and it was determined to utilize this ravine for the disposal of this waste material. In order to do this, a suspended track was carried over the ravine hung on wire ropes. These wire ropes cross the ravine to a tower 40 ft. in height which is securely guyed. The two cables are 640 ft.

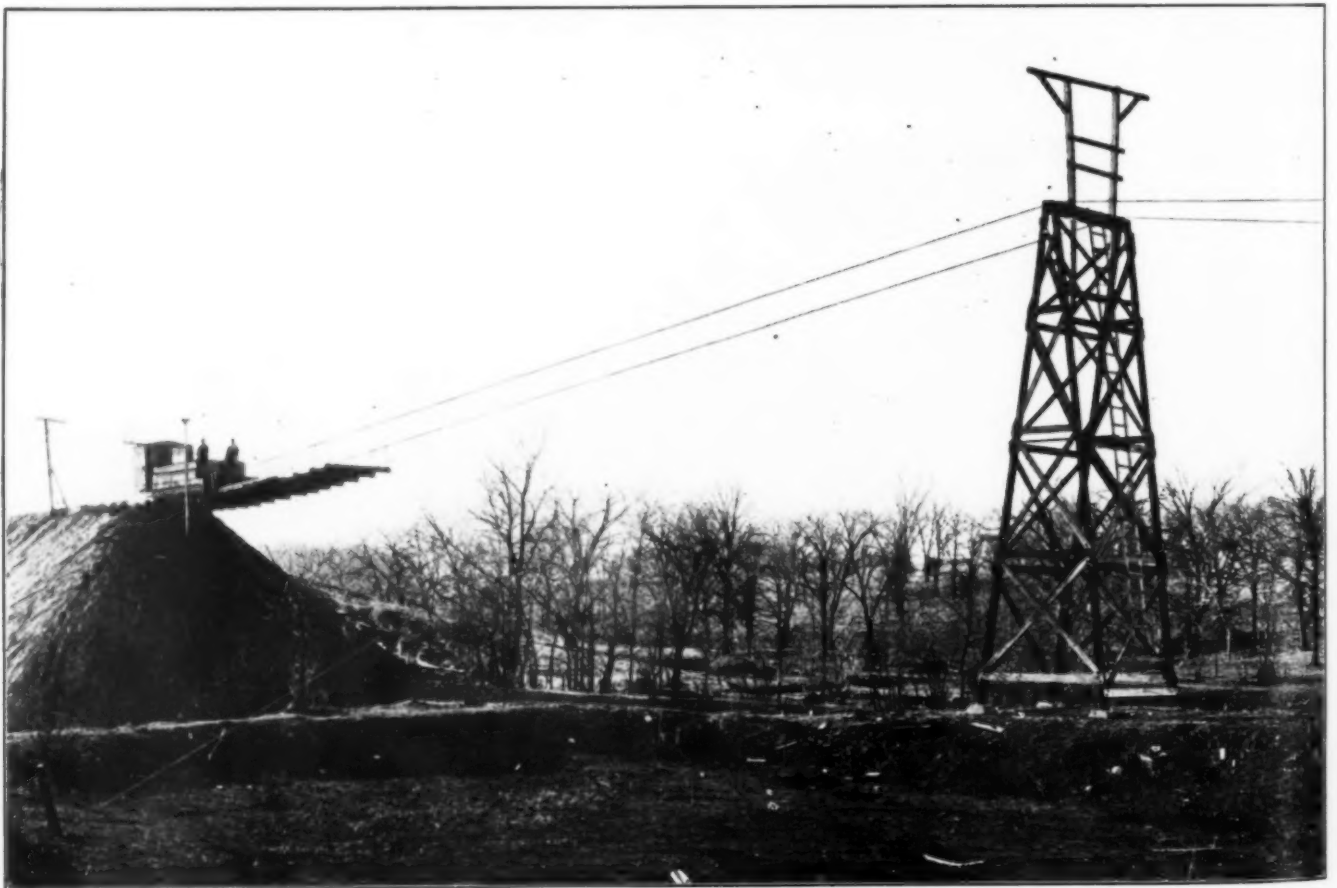


ELECTRIC SHOVEL STRIPS 14 FT. OVERBURDEN

long. The ties which carry the suspended track are swung 30 in. below the main cables, thus maintaining a center of gravity below the cables. A bumper stops the car at the proper dumping point. This bumper is illustrated in the small photograph at the left on page 15.

The other photograph on page 15 shows the method used to tighten the long cables. A 4-lug clamp is used to hold the turnbuckles, and a bent tube is used for turning them.

The overburden is stripped by a $\frac{3}{4}$ -yd. electric shovel that transfers it to a bottom dump car. This car is electrically driven and runs over standard-gage track to the point where the material is to be deposited. The car weighs about 5 tons and handles a load of



TOWER WHICH SUPPORTS SUSPENDED TRACK, SHOWING CAR READY TO DUMP WASTE MATERIAL AT END OF FILL

about 10 tons. The car dumps all on one side so that the track is moved sideways on top of the grade as required in order that the dirt will clear the top edge of the grade as the fill progresses.

The clay deposit itself is a hard shale that averages about 70 ft. in depth and is dug by an excavator of the



THE BUMPER PLACED ACROSS THE CABLES STOPS CAR AT PROPER POINT



THE LONG CABLES ARE TIGHTENED BY 4 LUG CLAMP ON TURNBUCKLES

company's own design. An electric car of 10 tons capacity carries the clay to the plant.

The installation of the suspended bridge with its wholesale method of disposing of the overburden has cut down the cost from about 30 cents to about 3 cents per yard.

HANDLING STICKY CLAY ON WELLAND CANAL

AN unusual material handling problem and its solution is shown in the photograph below. It was taken on the Welland Canal, where the material excavated was like plastic clay. This peculiar consistency makes it very hard to handle. The steam shovels load on the dump cars great balls of this material about

6 ft. in diameter. At first the contractors used straw to keep this clay from sticking to the bottom of the cars. Then they hit upon a better plan—they turned the hose on the slopes where the cars were being dumped. They had also turned water on the sides and bottom of the cars before loading.



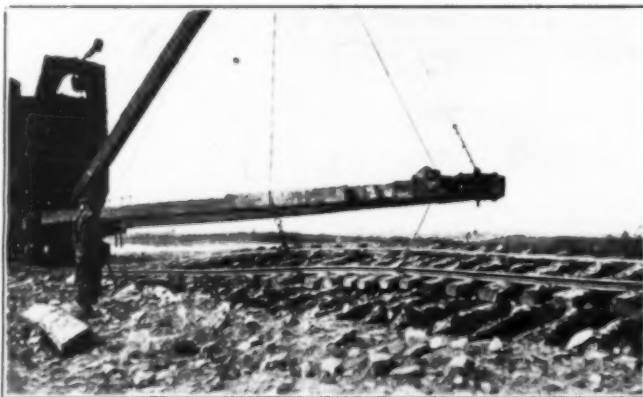
THE MEN WORKING WITH THE HOSE CAN BE SEEN IN THE CENTER OF THE PHOTOGRAPH BESIDE ONE OF THE DUMP CARS

DOING THINGS IN A BIG WAY

Ore Stripping on Mesaba Range Demands Special Equipment

EARTH-MOVING operations have been developed along big lines on the Mesaba Iron Range. Back in the early 90s the stripping operations necessary to uncover the ore were begun with the use of small hand dump cars. Year after year bigger and bigger cars have been used until now the excavated material is being carried away in specially designed air dump cars with a capacity of 30 yd.

The photographs which accompany this article show various stages of the operations conducted by the Oliver Iron Mining Company, which is a subsidiary of the United States Steel Corporation. The Oliver Iron Mining Company does work on such a big scale that a single recent order called for 100 30-yd. cars. It is said that a shovel with a 10-yd. dipper is being designed for use with these cars. Such a dipper would be approximately 6 ft. long, 6 ft. wide and 7½ ft. high and will drop a load of 20 tons into a dump car each minute. The 8-yd. dippers in use at present dump a load of 15 tons from a height of several feet, and therefore the cars have to be designed with almost inde-



TRACK-MOVING MACHINE ON THE JOB

structible floors. They also have to be reinforced and strengthened in various ways, thus making a special "Range" type of large dump car.

The upper photograph on this page shows one of the methods of moving track, an operation which has to be performed frequently because of the great quantities of materials for which new dumping ground has to be found.

The lower photograph on this page shows a big shovel stripping ore and loading dump cars on the embankment above it. The large photograph on the next page as well as that in the upper right-hand corner show how the material is dumped.

The Oliver Iron Mining Company is the largest operator on the Mesaba Range and moves about 18,000,000 cu. yd. of ore and overburden every year. Some 25,000,000 to 30,000,000 cu. yd. of material are moved every year on the Mesaba Range.

These figures mean that the iron mining companies have to be continually on the watch for improvements in both methods and the equipment used, as even what may seem at first glance a very small change



THE STRIPPING OPERATION. BIG 8-YD. SHOVEL LOADING 30-YD. AIR DUMP CARS

will mean a big saving when it is applied to the handling of 18,000,000 cu. yd. of ore. For that reason the adoption by the iron companies of air dump cars is a good indication that this type of equipment is



TAMPING TIES WITH COMPRESSED AIR

thoroughly efficient when used for disposing of large quantities of waste material.

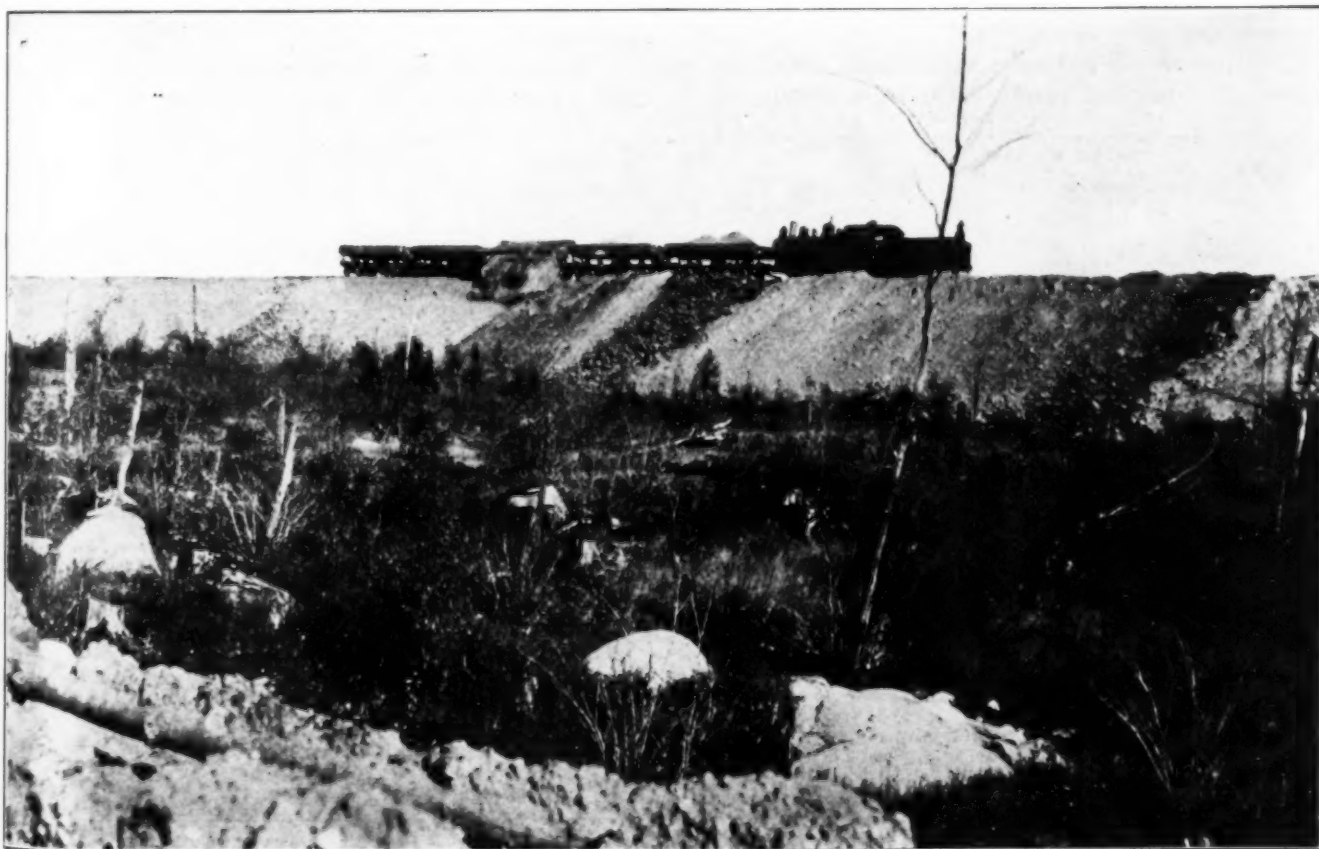
The specially strengthened range type of car, of course, is not necessary on work where the wear and



THE HEAVY CARS ARE DUMPED BEFORE THEY ARE ALLOWED ON THE TRESTLE

tear is not so great, but the automatic air dump car is handled so easily from the locomotive that it means a great saving in labor whenever the quantity of material to be used and the length of the haul justifies its use.

The experience of the "big fellows" in any line of work is always worth the observation of those with similar, although smaller, problems to solve.

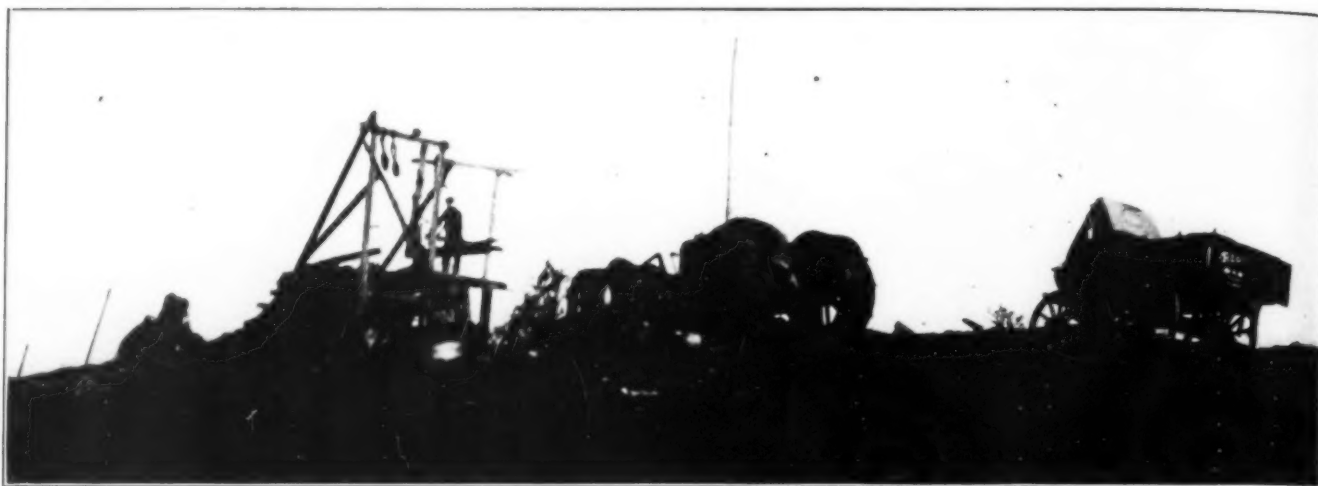


DUMPING THE EXCAVATED MATERIAL, SHOWING THE MAGNITUDE OF THE BIG FILLS

A ONE-MAN GRAVEL SCREENING PLANT

Michigan Highway Contractor Finds Way to Prevent "Chatter Bumps" in Road Surfacing

By PAUL L. FETHERSTON, Resident Engineer,
Michigan State Highway Dept.

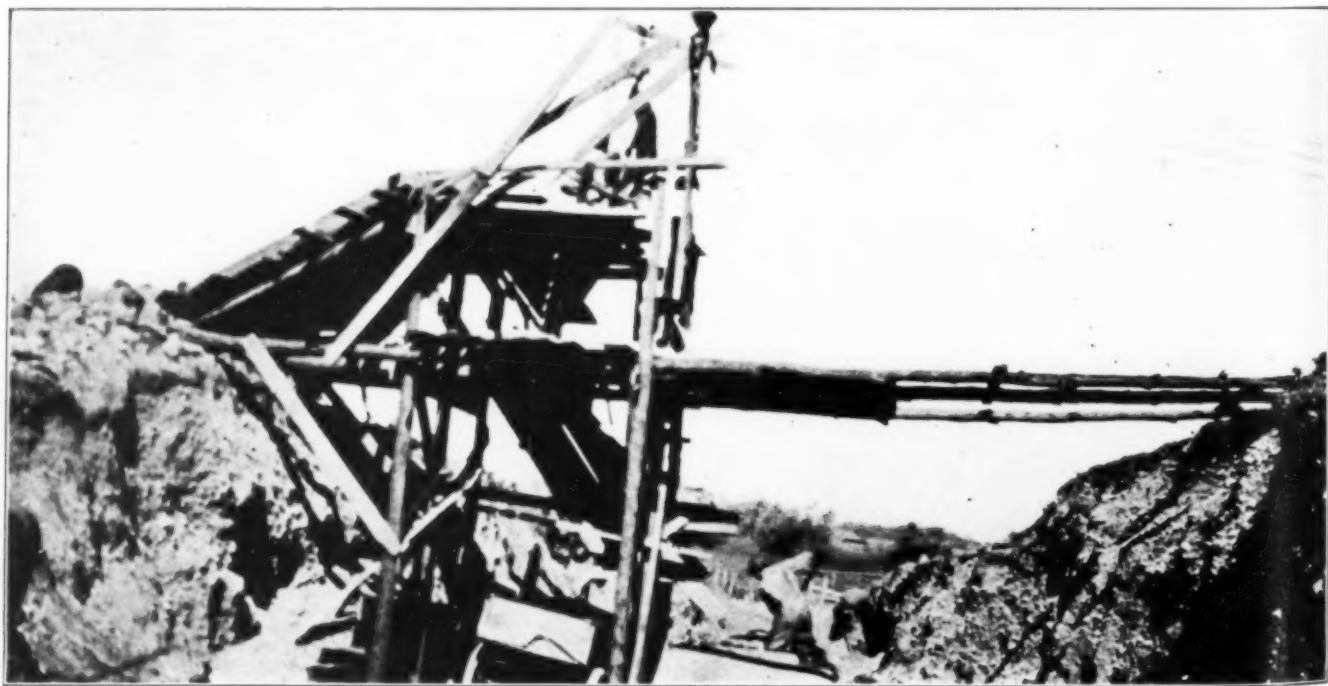


THE gravel used in surfacing most trunk line highways must be composed of pebbles of such size that the entire product will pass through a screen having 1-in. openings and be largely retained on a screen with $\frac{1}{8}$ -in. openings. This large or oversized stone will cause a gravel surface to develop "chatter bumps" if they are placed on a road and an excess of fine material and sand that will pass the $\frac{1}{8}$ -in. screen is detrimental also, as it helps to shorten the life of the surface.

In order to meet these specifications a number of types of screening plants have been developed by

contractors. The plant pictured herewith is unique in several ways. Usually several men are required to operate a plant of this size, whereas this one is run by one man. From a platform near the top of the plant, which is equipped with a system of levers he operates the dragline bucket which brings the material up from the pit and dumps it into a bin over a rotary screen. He also controls the tractor motor which furnishes power for the plant, from the same position.

The oversized stone is removed by the rotary screen and the material drops on to a vibrating screen where



TWO VIEWS OF THE PLANT SHOWING OPERATOR ON PLATFORM

the remaining excess of fine material is taken out.

The finished product is then deposited in one truck while the sand and stone that has been screened out drops into another.

When the trucks are filled the operator closes the

outlet to the bin and thus stops the flow of material until other trucks are placed under the loading spouts.

This plant is so assembled that it can be taken apart and loaded onto four trucks ready to be moved to a new location, by a gang of eight men, in one day.

CRANE TOWS BARGE TO UNLOADING POINT

A SIMPLE and ingenious method of moving a barge loaded with gravel was observed recently on the waterfront of a Hudson River town. The barge had been moored to the dock at a point where it was inconvenient to unload and it had to be pulled along about 50 or 60 ft. A crane mounted on crawler traction and equipped with a clamshell bucket was handling the work of unloading, so it made its way along the dock to where the barge was moored, dropped its

bucket into the gravel, letting it dig in far enough to get a firm hold, and then started back to the unloading point where the trucks were waiting. By avoiding a sudden jerk in starting which might have pulled the bucket loose, the crane operator managed to pull the barge along against the tide until he had it where he wanted it. Then he closed the bucket tight, hoisted out the first load and began filling up the nearest truck.

CALIFORNIA HIGHWAY COMMISSION STORES SURPLUS TRUCKS IN UNUSED HANGARS ON AVIATION FIELD

THE California Highway Commission has obtained the use of Mather Field, one of the army aviation fields for the purpose of storing surplus equipment, including a large number of the trucks which were received from the Federal Government. In all California has received from the Government 1175 motor trucks, 109 automobiles and 121 motorcycles.

At present the Commission is using 682 trucks, 56 automobiles and 59 motorcycles in its work in different parts of the State. In addition a number of trucks

were leased to the various counties for use in road work and 284 of them are now so employed on county roads.

The hangars at Mather Field will be used to store the extra trucks and other equipment until such time as they can be of service. In the meantime they will be protected from the weather, and as the Commission maintains a well-equipped repair shop at Sacramento, no time will be lost in getting them into shape for work.

OLD SHOVEL HOUSE USED AS TRAVELING MACHINE SHOP

IN order to save time at the quarry of the Virginia Limestone Corporation, at Klotz, Va., a traveling machine shop has been put into service. Previously one of the big jobs around the quarry was that of running the steel between the drills and the machine shops and then back again to the job. Altogether too many men were employed at this work and confusion resulted.

Superintendent Bobbitt made up his mind to find some way to remedy these unsatisfactory conditions. In the junk yard stood an old steam shovel that had apparently outlived its period of usefulness. He



stripped it of machinery, patched up the body and mounted on it all of the necessary drill sharpening equipment. This traveling machine shop is now equipped with a forge, an anvil, drill sharpener, and such other tools and appliances as are required to handle work of this kind. As the steam shovel's regular railroad trucks were left on this traveling shop, it can be hauled to any location that is convenient for the work. In this manner the distance from the point where the drilling is done and the point where the drills are sharpened is always the shortest possible distance and the steel is quickly handled.

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This advisory engineering service is at your disposal. It is supplemented by an organization thoroughly experienced in shipping heavy machinery to all parts of the world.

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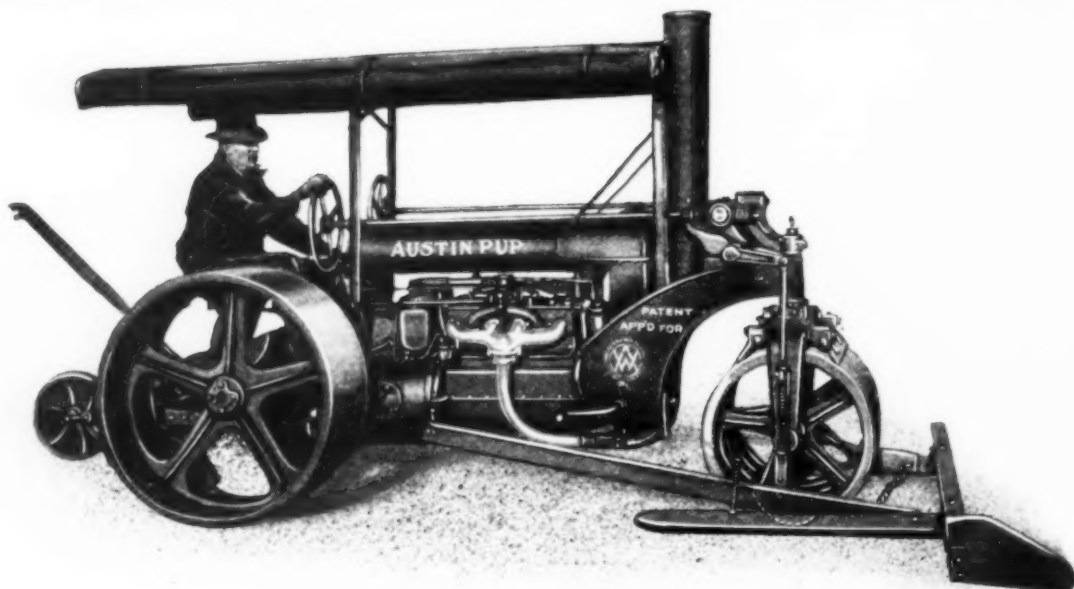
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The Pup Complete with Maintainer and Scarifier

The Austin Pup

Weight: 3, 3½ or 4 tons

THE AUSTIN PUP is the undoubted sensation of the road building and maintenance fields. Exhibited for the first time at the Chicago Good Roads Show in January, where it attracted far more than its proportionate share of attention, it has already become one of the most popular tools with contractors and public officials of all classes from State to Township and City to Village. The reason for such universal popularity is not hard to discover; the Pup adapts itself perfectly to a surprisingly wide range of work and clearly surpasses older methods in every instance, as is shown by the following excerpts from a few of the letters we have received from enthusiastic users.

C. M. Upham, State Highway Engineer of North Carolina, writes that "The Austin Pup Roller that we are utilizing in our experimental work is giving exceptionally good results. We are also using the Pup Roller in rolling surface stone on bituminous macadam maintenance. We find that this machine is very handy in working out many of these details."

From Ritchie & Ramsey, Topeka, Kansas, Contractors, we learn that "The Pup has more than lived up to our fondest expectations. Frank Bills, who has always been our roller man, and who has operated about every piece of machinery that a street or road contractor could possibly use, states that the Pup, from a standpoint of economy in operation, simplicity of design and diversity of uses to which it can be put, exceeds every piece of contractor's machinery he has ever seen."

PRICE AND SERVICE are two of the Pup's most attractive features. By utilizing the Fordson tractor to furnish the motive power, we have taken advantage of Ford's costs which are below anything known in the world because he builds his goods by the hundreds of thousands; and the first cost of the Pup is, therefore, considerably below what it would be if we were to build it complete. An arrangement has also been made whereby the Ford Motor Company, of Detroit, pays the local Ford dealer, in the territory where the Pup is delivered, a commission on the Fordson part of the outfit, so the Pup owner receives dealer service and prompt deliveries of Fordson parts from the Ford dealer in addition to the service maintained by our numerous warehouses and service stations.



Rolling Subgrade



Planing a Rough Mountain Road

Roller and Road Maintainer

Furnished With or Without Maintainer and Scarifier Attachments

WEST VIRGINIA adds this testimony: "The pictures are of the Pup working on one of the hardest propositions I think I ever saw in West Virginia. The ruts on the road were anywhere from one foot to eighteen inches in depth, but the little Pup waded right in and sure did plane the road down. One of the tax-payers passing by while the machine was working remarked that it was worth more than any other road machine he ever saw on any work; that all the work that they had done with the road grader this year was wasted money. Made four trips over a little more than a mile of road and reclaimed it from practically an impassable piece of road to one over which autos could drive with comfort, with about six hours work."

F. E. Ross, City Engineer of Jefferson, Mo., says that "The Pup has been in use almost every working day since we received it and is giving the best of satisfaction."

"It has abundance of power. We have used it on grades as high as 12 per cent and have never had to use low gear. We took the roller to the city park to roll the golf links. On the way to the park it had to climb a 20 per cent grade on a gravel road. As the grade was so steep that the roller would spin its wheels, we put a few lugs on each wheel, put the machine in high gear and went over the top."

"Before buying the roller we had all patches tamped. The tamping was the most expensive part of the repair work, wore the men out and took about three-fourths of their time. Since we received the roller, the same crew is doing about four times as much work as before, is doing 100 per cent better work, and at a saving sufficient to more than pay for the roller this season."

A special circular tells the whole story of the Pup Roller and Road Maintainer, and its many uses.
Write for a copy today.

**The Austin-Western
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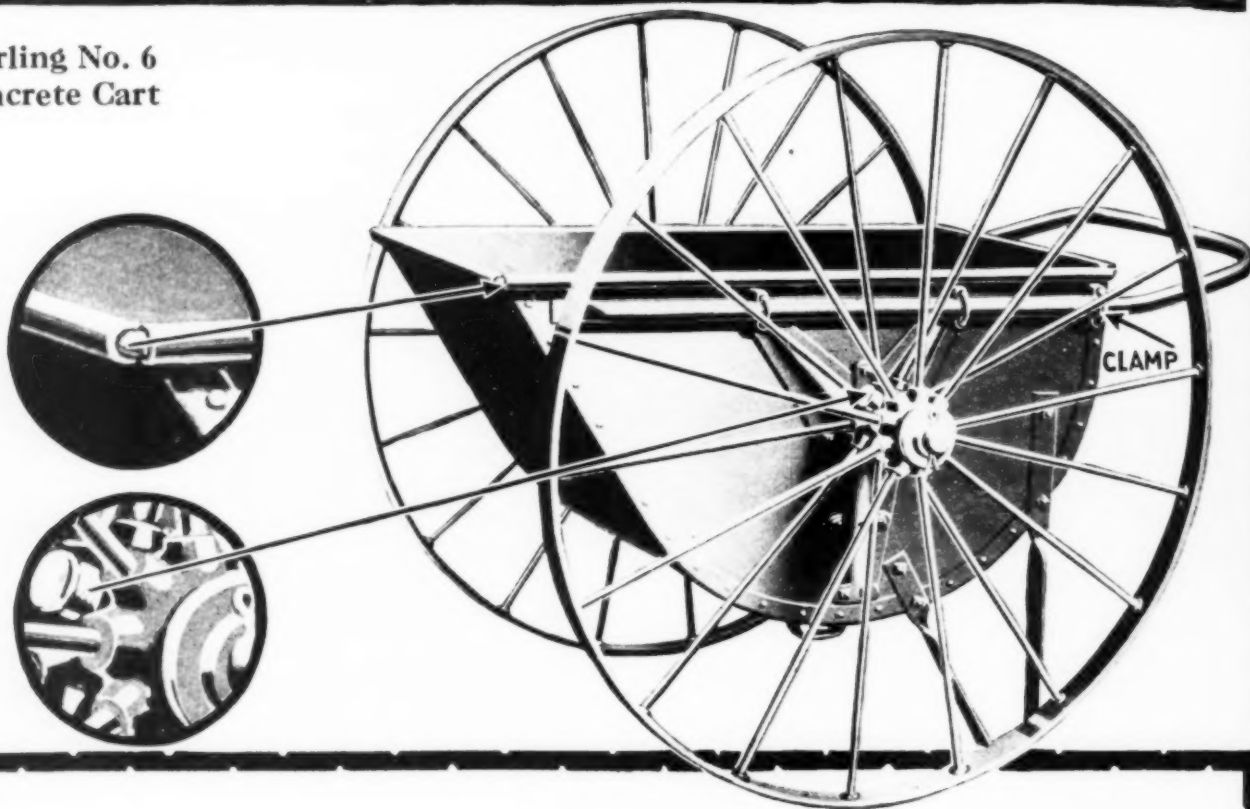
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*Sterling***STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER****Sterling No. 6
Concrete Cart**

When you consider the average load of concrete wheeled in a concrete cart is 6 cu. ft., or approximately 900 pounds, that this load is roughly handled over irregular runways, and often over projections or down a step or two, you know what a cart is up against.

Certainly you want an article made strong enough to stand the gaff—this is it!

Tray is 12 gauge throughout. Note its double reinforcement at top edge, its heavy malleable brackets, its clamped handle, its 42-in. wheels with grease cups.

The Sterling Catalogue is worth having and keeping

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